Standard Specification
For

Use of Recycled Asphalt Shingle as an Additive in Hot Mix Asphalt

1. SCOPE

1.1 This specification covers recycled asphalt shingle material used as an additive in hot mix asphalt (HMA). The use of recycled asphalt shingle in hot-in-place pavements, cold-in-place pavements, and cold recycled pavements is not included in this specification.

1.2 The values stated in SI units are to be regarded as the standard.

Note 1 – Refer to "R-2005A TS-2c" "Standard Recommended Practice for Design Considerations when using Recycled Asphalt Shingles in New Hot Mix Asphalt" for information on mix design, determining shingle aggregate gradation and binder considerations, when designing HMA mixtures which incorporate recycled asphalt shingles as an additive.

2. DEFINITIONS

2.1 The definition of coarse and fine aggregate in terms of bituminous paving mixtures is provided in AASHTO M 29, ASTM C 125, and D 692.

2.2 *Manufactured Shingle Waste* – For the purpose of this specification, shall mean rejected asphalt shingles or shingle tabs that are discarded in the manufacturing process of new asphalt shingles.

2.3 *Post-Consumer Asphalt Shingle* – For the purpose of this specification, shall mean asphalt shingles that are removed from the roofs of existing structures when the new roofs are being installed. Post-consumer asphalt shingle is often called "Tear-Off" shingle.

2.4 *Recycled Asphalt Shingle* – For the purpose of this specification, shall mean either manufactured shingle waste or post-consumer asphalt shingle that has been processed into a product that meets the requirements of this standard.

2.5 *Shingle Asphalt Binder* – For the purpose of this specification, shall mean the asphalt binder that is present in the recycled asphalt shingle.

2.6 *Shingle Aggregate* – For the purpose of this specification, shall mean, mineral granules, sand, or other mineral matter present in the recycled asphalt shingle, excluding the shingle fiber content.

2.7 *Shingle Fiber* – For the purpose of this specification shall mean, glass felt, paper felt, foil, fabrics of films used as the structural basis of asphalt shingle and other asphalt roofing products.

2.8 *Virgin Asphalt Binder* – For the purposes of this specification, shall mean new performance graded asphalt binder to be used in the new hot mix asphalt.

2.9 *Final Blended Binder* – For the purpose of this specification, shall mean the mixture of virgin asphalt binder and shingle asphalt binder.

2.10 *Virgin Aggregate* – For the purpose of this specification shall mean coarse and fine aggregate introduced into new hot mix asphalt that is exclusive of the shingle aggregate.

2.11 *New Hot Mix Asphalt* – For the purpose of this specification shall mean hot mix asphalt manufactured using aggregates, recycled asphalt pavement (if used), virgin asphalt binder, and recycled asphalt shingle.

3. REFERENCED DOCUMENTS

3.1 AASHTO Standards:

M 20 Penetration Graded Asphalt Cement
M 29 Fine Aggregate for Bituminous Paving Mixtures
M 43 Sizes of Aggregate for Road and Bridge Construction
M 226 Viscosity Graded Asphalt Cement
M 320 Performance Graded Asphalt Binder
MP 2 Superpave Volumetric Mix Design
PP 28 Volumetric Design for Hot Mix Asphalt
T 30 Mechanical Analysis of Extracted Aggregate
T 49 Penetration of Bituminous Materials
T 110 Moisture or Volatile Distillates in Bituminous Paving Mixtures
T 201 Kinematic Viscosity of Asphalts
TP 2 Quantitative Extraction and Recovery of Asphalt Binder from Hot Mix Asphalt

3.2 ASTM Standards:

C 125 Terminology Relating to Concrete and Concrete Aggregates
D 228 Asphalt Roll Roofing, Cap Sheets and Shingles
D 693 Coarse Aggregate for Bituminous Paving Mixtures

4. ORDERING INFORMATION

4.1 The purchaser or specifier shall include the following information in the purchase order or contract documents:

4.1.1 Reference to this specification and year of issue,
4.1.2 Additional testing requirements, and
4.1.3 Any exceptions to this specification.

5. SOURCES AND SAMPLING

5.1 Recycled asphalt shingle may be derived from either manufactured shingle waste or from post-consumer asphalt shingle (see Note 2).

5.2 Post-consumer asphalt shingle shall be processed prior to use to meet the requirements of Section 8 of this specification and shall consist of asphalt roll roofing, cap sheets, and shingles, including underlayment, only. Roofing debris, including coal tar epoxy, rubber materials, or other undesirable components, shall not be used.

5.3 Manufactured shingle waste and post-consumer asphalt shingles shall not be blended for the production of new hot mix asphalt.

5.4 Recycled asphalt shingle samples collected and analyzed, for the purpose of identifying the properties of recycled asphalt shingle as defined in this specification shall be representative of the recycled asphalt shingle material that will be used in the full production run of new hot mix asphalt.

Note 2 –Asphalt shingle material is construction debris and various state and local regulations may be applicable to its use. The user of this specification is advised to contact state and local transportation departments and environmental agencies to determine what additional requirements may be necessary.

6. GRADATION OF RECYCLED ASPHALT SHINGLE

6.1 Recycled asphalt shingle shall be processed so that 100 percent passes the 12.5 mm (0.5 inch) sieve, or as required by the specifying jurisdiction.

Note 3 – The hot mix asphalt supplier may wish to uniformly blend fine aggregate with the recycled asphalt shingle as a method of preventing the agglomeration of recycled asphalt shingle particles. The fine aggregate so added must be considered in the final gradation of the new hot mix asphalt.

7. ADDITION RATES OF RECYCLED ASPHALT SHINGLE

7.1 The addition rate of recycled asphalt shingle shall be such that the gradation of the new hot mix asphalt shall comply with the gradation requirements of the specifying jurisdiction (see Note 4).

Note 4 – The gradation of the new hot mix asphalt shall account for the shingle aggregate as well as the virgin aggregate. The shingle aggregate gradation shall be determined in accordance with the procedures outlined in **M-2005A TS-2c** Section 5 or an equivalent method approved by the specifying jurisdiction.

7.2 The addition rate of recycled asphalt shingle shall be such that the new hot mix asphalt shall comply with the volumetric mix design requirements of the specifying jurisdiction.

7.3 If the total available shingle asphalt binder content expressed as a fraction or percentage of the new hot mix asphalt content is greater than 0.75 percent (see Note 5), the virgin asphalt binder and shingle binder combination shall be further evaluated to ensure that the performance grade of the final blended binder complies with the performance grade requirements of the specifying jurisdiction (see Note 6).

Note 5 – The total available shingle asphalt binder content, expressed as a fraction or percentage of the new hot mix asphalt, is the product of the percentage of recycled asphalt shingle introduced into the new hot mix asphalt (P_s) and the percentage of shingle asphalt binder present in the recycled asphalt shingle (P_{sab}).

Note 6 – The performance grade and percentage of virgin asphalt binder introduced into the new hot mix asphalt shall be determined in accordance with the procedures outlined in **M-2005A TS-2c** Section 6 of the specification or an equivalent method approved by the specifying jurisdiction.

8. DELETERIOUS SUBSTANCES

8.1 Recycled asphalt shingle shall contain no more than 0.5 percent by total cumulative weight of extraneous waste materials including, but not limited to, metals, glass, paper, rubber, wood,

nails, plastics, soil, brick, tars, and other contaminating substances. This percentage shall be determined on material retained on the 4.75 Φm (No. 4) sieve.

8.2 Recycled asphalt shingle shall contain less than the maximum percentage of asbestos fibers based on testing procedures and frequencies established in conjunction with the specifying jurisdiction and state or federal environmental regulatory agencies.

9. METHODS OF SAMPLING AND TESTING

9.1 Sample and test the recycled asphalt shingle with the following methods of the American Association of State Highway and Transportation Officials, except as otherwise provided in this specification.

9.1.1 Sampling T 2.

9.1.2 Extraction of Bitumen TP 2.

9.1.3 Mechanical Analysis of Extracted Aggregate T 30